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BUREAU OF MINES MINERALS YEARBOOK

# The Mineral Industry of Utah

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This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising *Volume I, Metals and Minerals; Volume II, Area Reports: Domestic; Volume III, Area Reports: International.* The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

# The Mineral Industry of Utah

**This chapter has been prepared under a Memorandum of Understanding between the Bureau of Mines, U.S. Department of the Interior, and the Utah Geological and Mineral Survey for collecting information on all nonfuel minerals.**

**By Lorraine B. Burgin[1]**

The value of nonfuel mineral production declined from $657 million in 1983 to $524 million in 1984. Metal production fell to less than two-thirds of the total value of nonfuel mineral output because of low metal prices and the corresponding drop in copper, gold, silver, and vanadium production. In contrast, the total value of nonmetals output rose because of a record increase in construction activity.

Utah's principal commodities, in decreasing order of value, were copper, gold, portland cement, construction sand and gravel, silver, salt, potassium salts, phosphate rock, lime, crushed and broken stone, native asphalt (gilsonite), sulfuric acid, and molybdenum.

Nationally, the State ranked first in gilsonite and beryllium hydroxide production; second in potassium salts and magnesium metal; third in copper, gold, and vanadium; and fifth in molybdenum, phosphate rock, and silver.

**Table 1.—Nonfuel mineral production in Utah[1]**

| Mineral | | 1983 | | 1984 | |
|---|---|---|---|---|---|
| | | Quantity | Value (thousands) | Quantity | Value (thousands) |
| Beryllium concentrate | short tons | W | W | 6,030 | $6 |
| Clays[2] | thousand short tons | 227 | $1,569 | 315 | 2,223 |
| Copper (recoverable content of ores, etc.) | metric tons | 169,751 | 286,403 | W | W |
| Gem stones | | NA | 80 | NA | 80 |
| Gold (recoverable content of ores, etc.) | troy ounces | 238,459 | 101,107 | W | W |
| Gypsum | thousand short tons | 305 | 2,736 | 277 | 2,671 |
| Lime | do. | 315 | 16,771 | 297 | 16,471 |
| Salt | do. | 936 | 23,184 | 1,246 | 28,651 |
| Sand and gravel: | | | | | |
| Construction | do. | e9,800 | e19,800 | 15,217 | 34,507 |
| Industrial | do. | 24 | W | 11 | W |
| Silver (recoverable content of ores, etc.) | thousand troy ounces | 4,567 | 52,242 | W | W |
| Stone: | | | | | |
| Crushed | thousand short tons | 4,407 | 14,636 | e5,200 | e16,400 |
| Combined value of asphalt (native), cement, clays (fuller's earth), iron ore (usable, 1983), lead (1984), magnesium compounds, molybdenum, perlite (1983), phosphate rock, potassium salts, sodium sulfate, stone (dimension, 1983), vanadium, zinc (1984), and values indicated by symbol W | | XX | 138,051 | XX | 423,153 |
| Total | | XX | 656,579 | XX | 524,162 |

eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Excludes fuller's earth; value included with "Combined value" figure.

## Table 2.—Value of nonfuel mineral production in Utah, by county[1]

(Thousands)

| County | 1982 | 1983 | Minerals produced in 1983 in order of value |
|---|---|---|---|
| Beaver | $132 | (e) | Stone (crushed). |
| Box Elder | W | W | Stone (crushed), salt, silver. |
| Cache | W | W | Stone (crushed). |
| Carbon | W | $13 | Do. |
| Daggett | (e) | 6 | Do. |
| Davis | 2,126 | (e) | |
| Duchesne | 528 | 1 | Do. |
| Emery | 352 | (e) | |
| Garfield | W | 62 | Stone (crushed). |
| Grand | W | W | Potassium salts, salt. |
| Iron | 19,284 | 28,197 | Silver, iron ore, stone (crushed), gold. |
| Juab | 8,858 | W | Cement, stone (crushed), gypsum, clays. |
| Kane | W | 2 | Stone (crushed). |
| Millard | 5,135 | W | Lime, stone (crushed), perlite, gypsum, beryllium. |
| Morgan | W | W | Cement, stone (crushed). |
| Salt Lake | 425,137 | W | Copper, gold, silver, cement, molybdenum, salt, stone (crushed), sand and gravel (industrial). |
| San Juan | W | W | Vanadium. |
| Sanpete | W | W | Gypsum, clays, stone (crushed). |
| Sevier | 2,326 | 2,504 | Gypsum, salt, clays. |
| Summit | W | W | Clays, stone (crushed). |
| Tooele | 19,259 | 36,978 | Gold, lime, salt, potassium salts, stone (crushed), magnesium compounds, clays, silver, copper. |
| Uintah | 24,934 | W | Phosphate rock, stone (crushed and broken). |
| Utah | 5,575 | 1,473 | Stone (crushed), clays, gold, silver. |
| Wasatch | 368 | 54 | Stone (crushed). |
| Washington | 778 | 180 | Do. |
| Weber | 42,966 | W | Potassium salts, salt, magnesium compounds, sodium sulfate. |
| Undistributed[4] | r48,530 | 567,309 | |
| Sand and gravel (construction) | XX | e19,800 | |
| Stone: | | | |
| Crushed | e9,800 | XX | |
| Dimension | W | XX | |
| Total | r $616,092 | 656,579 | |

eEstimated. rRevised. W Withheld to avoid disclosing company proprietary data; included with "Undistributed."
XX Not applicable.
[1]Piute, Rich, and Wayne Counties are not listed because no nonfuel mineral production was reported.
[2]Construction sand and gravel was produced; data were not available by county. Total State value is shown separately under "Sand and gravel (construction)."
[3]Crushed and dimension stone (1982) was produced; data were not available by county. Total State values are shown separately under "Stone."
[4]Includes asphalt (native), gem stones, and perlite (1982), that cannot be assigned to specific counties, and values indicated by symbol W.
[5]Data do not add to total shown because of independent rounding.

## Table 3.—Indicators of Utah business activity

| | | 1982r | 1983 | 1984p |
|---|---|---|---|---|
| Employment and labor force, annual average: | | | | |
| Population | thousands | 1,571 | 1,618 | 1,652 |
| Total civilian labor force | do. | 676 | 694 | 721 |
| Unemployment | do. | 53 | 64 | 47 |
| Employment (nonagricultural): | | | | |
| Mining total[1] | do. | 18.2 | 14.0 | 12.7 |
| Metal mining | do. | 6.6 | 5.5 | 4.2 |
| Nonmetallic minerals except fuels[2] | do. | 1.0 | .9 | NA |
| Coal mining | do. | 5.2 | 3.2 | 2.8 |
| Oil and gas extraction[3] | do. | 5.4 | 4.5 | NA |
| Manufacturing total | do. | 85.7 | 85.5 | 94.2 |
| Primary metal industries | do. | 6.8 | 5.8 | 5.7 |
| Stone, clay, and glass products[2] | do. | 3.6 | 3.6 | NA |
| Chemicals and allied products[3] | do. | 3.9 | 3.5 | NA |
| Petroleum and coal products | do. | 1.0 | .9 | NA |
| Construction | do. | 26.9 | 28.7 | 35.0 |
| Transportation and public utilities | do. | 35.4 | 35.9 | 36.4 |
| Wholesale and retail trade | do. | 132.0 | 133.5 | 140.9 |
| Finance, insurance, real estate | do. | 26.6 | 28.0 | 29.8 |
| Services | do. | 109.7 | 112.5 | 121.3 |
| Government and government enterprises | do. | 126.4 | 128.8 | 131.1 |
| Total | do. | 560.9 | 566.9 | 601.4 |
| Personal income: | | | | |
| Total | millions | $13,685 | $14,593 | $16,074 |
| Per capita | | $8,709 | $9,021 | $9,783 |

See footnotes at end of table.

**Table 3.—Indicators of Utah business activity —Continued**

| | | 1982[r] | 1983 | 1984[p] |
|---|---|---|---|---|
| Hours and earnings: | | | | |
| Total average weekly hours, production workers | | 38.8 | 39.6 | 40.3 |
| Mining | | 42.6 | 41.7 | 43.2 |
| Total average hourly earnings, production workers | | $9.40 | $9.74 | $9.93 |
| Mining | | $11.88 | $12.48 | $12.26 |
| Earnings by industry: | millions | $85 | $89 | $106 |
| Farm income | do. | $10,167 | $10,799 | $11,983 |
| Nonfarm | do. | $587 | $463 | $449 |
| Mining total | do. | $207 | $193 | $156 |
| Metal mining | do. | $25 | $22 | $21 |
| Nonmetallic minerals except fuels | do. | $186 | $121 | $125 |
| Coal mining | do. | $168 | $127 | $147 |
| Oil and gas extraction | do. | $1,848 | $1,940 | $2,250 |
| Manufacturing total | do. | $235 | $203 | $219 |
| Primary metal industries | do. | $78 | $85 | $110 |
| Stone, clay, and glass products | do. | $67 | $67 | $79 |
| Chemicals and allied products | do. | $39 | $40 | $42 |
| Petroleum and coal products | do. | $633 | $692 | $849 |
| Construction | do. | $974 | $1,067 | $1,120 |
| Transportation and public utilities | do. | $1,690 | $1,797 | $1,975 |
| Wholesale and retail trade | do. | $443 | $521 | $599 |
| Finance, insurance, real estate | do. | $1,751 | $1,885 | $2,135 |
| Services | do. | $2,221 | $2,407 | $2,577 |
| Government and government enterprises | do. | | | |
| Construction activity: | | | | |
| Number of private and public residential units authorized | | 7,667 | 14,805 | 18,419 |
| Value of nonresidential construction | millions | $436.4 | $362.2 | $486.8 |
| Value of State road contract awards | do. | $85.0 | $179.0 | $187.2 |
| Shipments of portland and masonry cement to and within the State | thousand short tons | 599 | 793 | 974 |
| Nonfuel mineral production value: | | | | |
| Total crude mineral value | millions | $616.1 | $656.6 | $524.2 |
| Value per capita | | $392 | $406 | $317 |

[p]Preliminary. [r]Revised. NA Not available.
[1]Bureau of Labor Statistics totals may not add owing to inclusion of data from other sources.
[2]Bureau of Economic Analysis, Regional Economic Measurement Division, U.S. Department of Commerce.

Sources: U.S. Department of Commerce, U.S. Department of Labor, Highway and Heavy Construction Magazine, and U.S. Bureau of Mines.

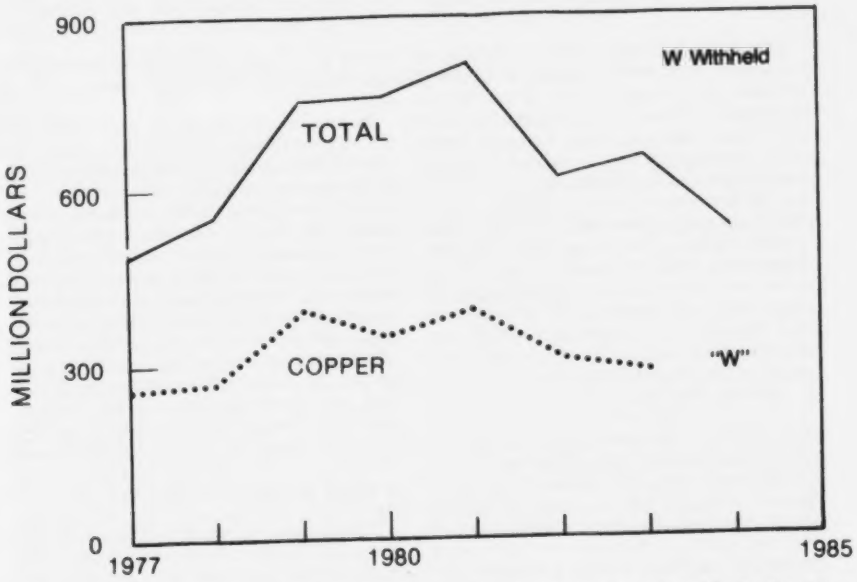


**Figure 1.—Value of mine production of copper and total value of nonfuel mineral production in Utah.**

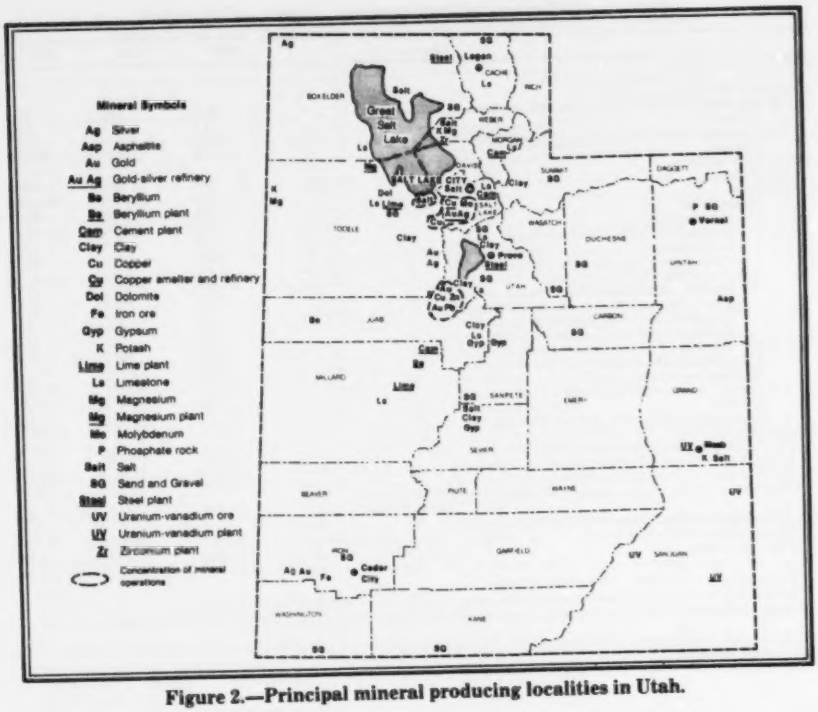


**Figure 2.—Principal mineral producing localities in Utah.**

**Trends and Developments.**—Mining in the State continued to suffer a series of setbacks. Copper production plummeted as Kennecott reduced output by two-thirds at its Utah Copper Div. when financial losses were exacerbated by the refusal of union representatives to renegotiate mid-1983 labor agreements with the company. Utah's copper industry contended with the lowest copper prices, in real terms, since the Great Depression, sluggish markets, large inventories, and increased competition from imports. Gold, molybdenum, and silver, important byproducts of copper production, also declined as copper mining was cut back and as prices for the precious metal were sharply reduced. Pig iron production increased; however, ores were shipped in from out of State and the depressed steel industry in the State competed with Japanese imports on the west coast, the industry's principal western marketplace for steel. Vanadium output declined sharply as consumption of ferrovanadium by domestic steel producers remained depressed and as continuing low prices for its coproduct uranium resulted in the shutdown of Utah's uranium operations.

In the nonmetals group, production declined even though output of most construction materials rose. Leading commodities, in descending order of value, included cement, construction sand and gravel, salt, potassium salts, phosphate rock, lime, crushed stone, gilsonite, sulfuric acid, gypsum, clays, and sodium sulfate. Declines were noted in all commodities except for the increased output of cement, clays, construction sand and gravel, and crushed stone, which was attributed to significant increases in residential construction and a near record rise in nonresidential construction. Other construction fell 87% in 1984 with the completion of certain powerplants, bridges, and highways, some of which were damaged by flooding in the Great Salt Lake area.[2]

The wet-weather cycle that began in 1982 continued during 1984, causing a rise in the level of Great Salt Lake to a peak of 4,209.6

feet and severely impacting industries on its shores. Magnesium, potash, and salt production were affected when the lake waters diluted their brines and damaged solar evaporation ponds; also, the zirconium industry lost waste water disposal areas to an invasion by Great Salt Lake waters. Potassium salts production declined significantly when most of Great Salt Lake Minerals & Chemicals Corp.'s solar ponds on Great Salt Lake were flooded. The company was the Nation's largest producer of sulfate of potash.

In a growing awareness of the importance of the lake to the State as well as to industries on its shores, the Utah Geological and Mineral Survey published two papers describing the sampling of brines and fluctuations of the levels of Great Salt Lake.[3]

Reduced activity was noted in coal, oil and gas, and uranium mining in Carbon, Emery, Grand, and San Juan Counties. In Emery County, a major disaster occurred in December when a fire at the Wilberg coal mine, operated by the Emery Mining Co. for the Utah Power & Light Co., claimed 25 lives. The mine was closed, causing many more layoffs.

**Legislation and Government Programs.**—The Governor signed four bills related to mining that were passed by the 1984 budget session of the 45th Legislature, meeting from January 9 to January 28. S.B. 22 exempted modernization, expansion, or new construction in the mining industry from the sales or use tax for 5 years beginning July 1, 1984; the exemption applied to purchases over $500,000 per year for materials, equipment, or services for any mine, mill, reduction works, smelter, refinery (except oil and gas), synthetic fuel-processing and upgrading plant, rolling mill, coal washing plant, or melting facility. H.B. 30 authorized the Division of State Lands to breach the Southern Pacific Railroad causeway and to construct a trestle to lower the water level of the Great Salt Lake south arm. S.B. 112 increased the occupation tax on oil and gas from 2% to 4% (except wells producing less than 20 barrels per day). H.B. 180 raised the corporate franchise tax (based on income) from 4% to 5%. The 3d special session of the 1984 45th Legislature passed S.B. 1, one provision of which provided an appropriation of $600,000 to the Water Resources Division to complete studies on Great Salt Lake management.

The U.S. Department of Energy and the Utah Department of Health awarded Argee Corp., Denver, CO, a $37.9 million contract to remove 2.9 million tons of uranium-vanadium tailings from the old Vitro Chemical Co. site in south Salt Lake City. The tailings will be moved by 100-ton, 100-car trains 85 miles to a remote area at Clive, Tooele County, after the disposal sites have been prepared. A $1.7 million plant will be built at Vitro to clean ground water and an aggregate plant at Clive to produce material to cover the tailings.

## REVIEW BY NONFUEL MINERAL COMMODITIES

### METALS

**Beryllium.**—Beryllium ore production declined in quantity and value during 1984. Brush Wellman Inc. continued as the principal producer of beryllium in the United States and the only company recovering the beryllium product from bertrandite ore. According to its 1984 annual report, Brush Wellman produced 402,000 pounds of beryllium in 1984, compared with 458,000 pounds in 1983. The average market price of beryllium dropped from $59 in 1983 to $54 per pound in 1984. The company estimated proven bertrandite ore reserves at 5.4 million short tons averaging 0.22% beryllium, as of December 31, 1984.

Bertrandite ores were surface mined by Brush Wellman and then trucked to its mill near Lyndall, north of Delta, Millard County, for processing into beryllium hydroxide. The company also purchased beryl ores, primarily from foreign sources, for treatment in a separate circuit, reactivated after an equipment failure in 1983. The beryllium hydroxide product was shipped to the company's Elmore, OH, plant for conversion to beryllium alloys, beryllia ceramic, and metallic beryllium.

**Copper.**—Copper production in the State continued to decline for the third straight year and, in 1984, dropped more than one-third in value as the average copper cathode price plunged from $0.7653 in 1983 to $0.6676 in 1984.

Utah's principal copper producer was Kennecott, a subsidiary of Kennecott Corp. acquired in 1981 by Standard Oil Co. of Ohio (Sohio). Sohio was 50% owned by British Petroleum Co. Ltd. The Utah Copper Div. at

Bingham Canyon, 25 miles southwest of Salt Lake City, included one of the world's largest open pit copper mines and a precipitate plant. Sixteen miles to the north were the company's Bonneville crushing and grinding concentrator and the Magna and Arthur flotation concentrators capable of treating 108,000 tons of ore per day; a smelter with an annual production capacity of 210,000 tons of copper anode; and a refinery with an annual capacity of 195,000 tons of copper cathode. The North Ore Shoot underground mine at Bingham was still being developed.

The Sohio 1984 10K Annual Report to the Securities and Exchange Commission showed the Utah Copper Div. mined and processed 21,965,000 short tons of ore yielding 139,891 tons of copper, compared with 33,310,000 tons of ore yielding 200,842 tons of copper in 1983. The average grade of ore mined increased from 0.626% copper in 1983 to 0.663% in 1984. In descending order of quantity, byproduct gold, molybdenum, silver, and selenium, also were recovered. Kennecott's total operating losses rose from $91 million in 1983 to $160 million in 1984, owing principally to a world oversupply of copper, deteriorating copper prices, and mine curtailment costs.

Kennecott reported that although its Utah property was competitive on a world scale, both in size and quality of reserves, the operation was not profitable because of low copper prices and antiquated mining, transportation, and concentrating facilities. The Magna mill was opened in 1907, the Arthur mill in 1908, and the Bonneville crushing and grinding plant in 1966. Modernization of the facilities was still under study during 1984. Proposed changes included in-pit crushing of ore, use of a conveyor system to carry ore to a concentrator to be built north of Copperton, and pipelining the concentrates to the Garfield smelter and tailings to the Magna ponds.

In December, the Salt Lake Planning Commission approved zoning changes allowing the construction of the concentrator and conveyor systems that were scheduled to begin in the third quarter of 1985 and to be completed in 1988, pending approval of Sohio's board of directors.

Citing continued losses and the failure of its unions to renegotiate its 1983 labor agreement, Kennecott slashed Utah Copper Div. production by two-thirds, beginning July 1. About 1,795 workers were gradually laid off during the remainder of the year. The total work force at Kennecott headquarters and Utah Copper Div. dropped from a peak of 8,000 workers in 1972, to 7,400 in 1981, to 4,400 in 1983, to 2,200 at yearend 1984. The copper worker's earnings averaged more than $22 per hour in wages and benefits in 1984, of which $13.38 was an average hourly wage, compared with an all-U.S.-industries average of $8.96 per hour.

A 5-year study, funded by Kennecott in 1983, continued to investigate ground water contamination from the Bingham Canyon operation. A company report to the State Water Pollution Control Committee, Safe Drinking Water Committee, and Solid and Hazardous Wastes Committee indicated no contamination of drinking water had been found, although shallow ground water in localized areas around evaporation ponds in South Jordan, the waste dump leaching system, and the Bingham Canyon Reservoir had been affected. In the 200-square-mile area studied in 1984, 4 wells were drilled to monitor the quality of deep ground water, and 64 private wells, 48 wells on Kennecott property, and 29 surface water sampling sites were checked. After contamination occurred in the Dry Fork area 5 miles north of the open pit, the company spent more than $10 million to build concrete-lined and clay-lined structures and evaporation ponds to capture expected heavy runoff water.

Kennecott and Anaconda Minerals Co. signed a Letter of Understanding for the cooperative operation of the mining and concentrating properties and facilities of the Bingham Canyon Mine and of Anaconda's adjoining Carr Fork Mine in early November. If the agreement is completed in 1985, Kennecott, the operator, would receive 96% of the production. The Carr Fork operation was shut down in October 1982 because of low copper prices and mining problems.

Sunshine Mining Co. shipped a copper-silver ore from the Trixie Mine, East Tintic mining district, Utah County, to Kennecott's Garfield smelter for use as a flux. Kennecott mined a small amount of copper at its precious- and base-metals Iron Blossom Mine, Tintic mining district, Juab County.

**Table 4.—Utah: Mine production (recoverable) of gold, silver, copper, lead, and zinc, by county**

| County | Lode mines producing[1] | Material sold or treated[2] (metric tons) | Gold | | Silver | |
|---|---|---|---|---|---|---|
| | | | Troy ounces | Value | Troy ounces | Value |
| 1982, total | 6 | 33,764,573 | 174,940 | $65,761,695 | 4,342,333 | $34,521,547 |
| 1983, total | 6 | 31,152,258 | 238,459 | 101,106,616 | 4,566,610 | 52,242,019 |
| 1984: | | | | | | |
| Box Elder | 1 | W | W | W | W | W |
| Iron | 1 | W | W | W | W | W |
| Juab | 1 | W | W | W | W | W |
| Salt Lake | 1 | W | W | W | W | W |
| Tooele | 1 | 1,029,453 | 79,105 | 28,529,851 | 2,594 | 21,117 |
| Utah | 1 | W | W | W | W | W |
| Total | 6 | W | W | W | W | W |

| | Copper | | Lead | | Zinc | | Total value |
|---|---|---|---|---|---|---|---|
| | Metric tons | Value | Metric tons | Value | Metric tons | Value | |
| 1982, total | 189,090 | $303,483,112 | W | W | -- | -- | W |
| 1983, total | 169,751 | 286,403,329 | -- | -- | -- | -- | $439,751,964 |
| 1984: | | | | | | | |
| Box Elder | -- | -- | -- | -- | -- | -- | W |
| Iron | -- | -- | -- | -- | -- | -- | W |
| Juab | W | W | W | W | W | W | W |
| Salt Lake | W | W | -- | -- | -- | -- | W |
| Tooele | -- | -- | -- | -- | -- | -- | 28,550,968 |
| Utah | W | W | -- | -- | -- | -- | W |
| Total | W | W | W | W | W | W | W |

W Withheld to avoid disclosing company proprietary data.
[1]Operations at which metals were recovered only from tailings or precipitates are not counted as producing mines.
[2]Does not include gravel washed.

**Gallium and Germanium.**—St. George Mining Co., a subsidiary of Musto Explorations Ltd., Vancouver, Canada, continued to develop the old Apex copper-silver-zinc property for gallium and germanium. Located west of St. George in the Tutsagubet mining district near the southern end of the Beaver Dam Mountains, the property consisted of 22 patented and 9 unpatented mineral claims and 2 leased claims. Mineralization was associated with the Apex vein and is in the form of an irregular chimney of leached, residual iron oxide in dolomite and limestone. Musto planned to invest more than $12 million to complete the development of the mine and to construct a processing plant.[4] By yearend, the warehouse, laboratory, and shop buildings had been completed and construction on the processing plant and tailings ponds commenced. Hazen Research Inc., Golden, CO, spent 2 years developing the new process in which a hot acid leach and cementation was to be used to recover copper and silver; solvent extraction would separate gallium, iron, and zinc; and germanium would be chemically separated from the raffinate. Stockpiled ore was expected to provide feed for about 18 months of production.

Gallium and germanium were used in electronic applications, and germanium was used for infrared optics, fiber optics, semiconductors, and detectors.

**Gold.**—Gold production declined in quantity and value as Kennecott's Utah Copper Div. cut back its Bingham Canyon operation and, consequently, its yield of gold recovered as a byproduct. The drop in gold production value was partly attributed to the plunge in the price of gold from an average of $423.823 per troy ounce in 1983 to $360.656 in 1984. Additional gold producers, in descending order of output, included the Mercur gold mine of Getty Mining Co., a wholly owned subsidiary of Texaco Inc.; the Escalante Mine of Hecla Mining Co.; and the Iron Blossom Mine of Kennecott.

Getty Mining completed its first full year of production at its Mercur gold project, Camp Floyd (Mercur) mining district, Tooele County, 65 miles south of Salt Lake City and 30 miles southeast of Tooele. The mine continued as the State's second largest gold producer.

In February, Texaco took over Getty Oil Co., the parent company of Getty Mining, and by yearend, was discussing selling the company's Utah gold and coal properties.

According to the Gold Standard Co. 1984 annual report, 30,000 troy ounces of gold were recovered in 1983 from the Mercur ores and 80,000 troy ounces in 1984. Gold Standard, owner of the mine's original 4,500 acres, was to receive 15% of the net profits after Getty Mining recovered its own investment. A brief history and engineering design of the Mercur gold project ore processing facility were described in the literature.[5]

**Iron Ore and Steel.**—Utah iron ore production ceased in 1982. The last stockpiled ore in the Iron Springs mining district near Cedar City was shipped in 1983 by United States Steel Corp. (USS) to its Geneva Works near Provo. In 1984, pig iron shipments increased nearly 60% in quantity and value, and iron and steel slag sold and used increased 122% in quantity and more than 64% in value.

With the permanent closing of its Atlantic City, WY, iron ore mine in October 1983, USS supplied its Geneva plant mainly with taconite iron ore pellets from its Minnesota operations. Factors considered in using the higher quality Minnesota ores were mining conditions and lower labor and energy costs. The company also sold its Columbia and Geneva underground coal mines in Carbon County to Kaiser Steel Corp. and continued obtaining coking coal for the steel plant from its captive Somerset Mine near Paonia, CO. At the Geneva Works, the number of open-hearth furnaces in operation was reduced from five to three and layoffs totaled nearly 400 workers, bringing total employment down from 5,000 in 1981 to 2,400 by yearend 1984. Utah County union membership dropped from a peak of 3,800 workers in 1981 to 1,800 in 1984. A privately published study analyzed the forces and issues behind the crisis of the domestic basic steel industry and the implications of national problems for the Geneva Works.[6]

Nucor Steel Co., a division of Nucor Corp., operated its 400,000-ton-per-year steel minimill at Plymouth, Box Elder County. In April, flat demand and competition with other domestic mills and foreign imports forced the company to cut back from a 5- to 4-day week, and mills were reduced from 15 turns per week to 12 turns; no workers were laid off. Products manufactured included reinforcing bars, channels, angles, rounds, flats, and coiled rounds. Nucor's Vulcraft Div. at Brigham City used steel products from the Plymouth operation for the manufacture of joists and joist girders. At the Nucor Grinding Ball Div. near Brigham City, depressed conditions of the mining industry slowed production of steel grinding balls.

**Magnesium.**—Magnesium metal production increased in amount and value, owing in part to a rise in demand for the metal and a small increase in price.

AMAX Magnesium Corp., a subsidiary of AMAX Inc., operated the Nation's second largest magnesium plant on the south arm of Great Salt Lake at Rowley, Tooele County. Magnesium was recovered from lake brines concentrated in 40,000 acres of solar evaporation ponds, processed into magnesium chloride, and electrolytically separated into magnesium metal and chlorine. Heavy precipitation in 1983 diluted lake brines and necessitated a continuing $15 to $20 million project to raise dikes protecting the ponds; in 1984, the plant was altered to process brine with 5.8% magnesium instead of 7.2% magnesium. To augment its own supply of brine, AMAX purchased 300,000 short tons of magnesium chloride from the Kaiser Aluminum & Chemical Corp. plant at Wendover in exchange for 9,000 tons of magnesium metal from AMAX. AMAX also experimented with increasing evaporation by using a triphenyl methane (Neptune Blue) dye to absorb sunlight and raise the water's surface heat, thereby accelerating the evaporation rate. According to the AMAX 1984 10K Annual Report, the Utah facility was operated at a production rate of 35,000 tons per year and made a small profit for the first time in the company's 12-year history.

**Molybdenum.**—The Utah Copper Div., the only molybdenum producer in the State, continued to ship molybdenum concentrate recovered as a byproduct of copper production. As the company's copper output was cut back in mid-1984, the quantity of molybdenum concentrate recovered declined 5.38%. With drawdown on stockpiles, total molybdenum concentrate shipments increased less than 2% in quantity and value. Although exports dropped about 12%, domestic shipments increased dramatically, and by yearend, molybdenum concentrate stocks had been reduced 28%. The U.S. Bureau of Mines estimated the average producers' price dropped from $3.65 per pound in 1983 to $3.50 per pound in 1984.

**Silver.**—Silver output declined in quantity and more than one-third in value as the average price of the metal slipped from $11.44 per troy ounce in 1983 to $8.14 in

1984. The principal silver producer in the State was Hecla's Escalante Mine, Iron County, followed by Kennecott's Bingham Canyon Mine, Salt Lake County; Sunshine's Trixie Mine, Utah County; United Silver Mines Inc.'s Vipont Mine, Box Elder County; Getty Mining's Mercur gold project, Tooele County; and Kennecott's Iron Blossom Mine, Juab County.

Hecla acquired the Escalante Mine in a merger agreement completed with Ranchers Exploration and Development Corp. on July 26, 1984. Since 1975, Ranchers had leased and developed the Escalante Silver Mines Co. Inc. properties 42 miles west of Cedar City, Iron County, and on November 30, 1983, exchanged 345,884 net shares of Escalante Silver Mines. Escalante owned the production royalty, a 10% net profits interest, and the reversionary rights in the mill and mine properties, then operated by Ranchers. After the death of its chief executive officer, Ranchers became the object of complex merger manuevers by First Mississippi Corp., Sunshine, and Hecla, with Hecla emerging as the winner.

While operating the Escalante, Ranchers applied a blasthole open stoping mining system called "end slicing," which the company developed from the vertical crater-retreat mining method initially used at the mine. Mine production was normally 1,000 to 1,200 short tons of ore per day and 350 short tons of waste per day. The Merrill-Crowe precipitation process was used at the 750-ton-per-day mill to recover the silver and a refinery in the mill applied an acid leach to remove the base metals before smelting. Metallurgical recovery at the mill was about 81% of the silver in the ore, with estimated direct milling costs of $1.53 per fine ounce during fiscal year 1983-84.[7]

According to the Hecla 1984 annual report, the Escalante Unit recovered 2,235,781 troy ounces of silver in 1984, compared with 2,247,479 troy ounces in 1983. As of December 31, 1984, reserves were estimated at 2,621,400 tons of ore with 9.4 ounces of silver per ton, compared with 1,582,000 tons with 10.4 ounces per ton in 1983. Exploration during the year indicated a southerly extension of a vein that may add several years to the life of the mine.

The Sunshine 1984 annual report showed the Trixie Mine, East Tintic mining district, Utah County, shipped 21,545 tons of flux ore containing 114,938 ounces of silver, 3,357 ounces of gold, and 438,393 pounds of copper to the Kennecott Garfield smelter in 1984.

In 1984, exploration at the mine totaled 3,460 feet of drifting, 414 feet of raising, and 5,883 feet of long-hole drilling. As of December 31, 1984, reserves were estimated to be 64,540 tons of ore containing 470,588 ounces of silver, 7,187 ounces of gold, and 1.8 million pounds of copper.

At the Burgin Mine, also in the East Tintic area, the Apex No. 2 shaft was completed to the 1,300-foot level in late 1984, and an access drive totaling more than 1,965 feet of drifting was connected with the old Burgin workings when work was suspended pending further evaluation of the project. Working temperatures at one area of the mine were decreased from 130° F to 85° F by installing a refrigeration unit. Resumption of normal metal prices, more favorable metal markets, and favorable findings on the detailed feasibility studies were deemed necessary to bring the Burgin Mine into production again. Reserve estimates increased to 1.9 million tons of ore containing 33.8 million ounces of silver, 65,600 ounces of gold, 288,700 tons of lead, and 109,100 tons of zinc.

The Tintic mining district, which ranked first in Utah's total silver production and second in gold, was described in the literature.[8]

**Vanadium.**—Vanadium production continued to fall, plunging 82% in tonnage and 87% in value, as the prices of its coproduct, uranium, fell from January's $22 per pound of $U_3O_8$ to $15.25 per pound at yearend, and producers shut down or cut back operations. During part of the year, vanadium was recovered from the uranium-vanadium ores of the Colorado Plateau and shipped to the Atlas Corp. mill near Moab, Grand County, or to the Union Carbide Corp. mill at Uravan, CO.

In February, the Atlas Minerals Div. of Atlas Corp. began to idle its properties, including its last three operating mines—Pandora, Velvet, and Rim Columbus—in San Juan County and its Moab uranium-vanadium mill in Grand County. Before completing the shutdown in mid-May, the company processed a large stockpile of ore and drew down its inventory of chemical milling agents. About 175 workers were laid off and 30 retained to maintain the facilities on a standby basis pending an improvement in the uranium market. According to the company, in its fiscal year ending June 30, 1984, Atlas Minerals sold 308,000 pounds of $U_3O_8$ in concentrate and 2,783,000 pounds of vanadium pentoxide recovered from stock-

piled ore in 1984, compared with 1,386,000 pounds of $U_3O_8$ in concentrate and 1,405,000 pounds of vanadium pentoxide in 1983 from ores mined in Colorado and Utah. The corporation reported a net loss of $3.89 million in its fiscal year 1984, compared with a $19.4 million profit in 1983.

In anticipation of eventually resuming operations, Atlas continued to seek feed for its Moab plant and acquired additional ore reserves in properties contiguous to its Green River area mines. Feasibility studies were also conducted on the Farley (formerly called Bullfrog) uranium-vanadium deposit, 10 miles north of Ticaboo, Garfield County.

Following a preliminary agreement signed in February 1983, effective January 11, 1984, Union Carbide, Danbury, CT, acquired a 70% interest in Energy Fuels Nuclear Inc.'s White Mesa uranium-vanadium mill near Blanding. Built in 1980, the facility had been idle since January 1983 because of the weak demand for uranium. Umetco Minerals Corp., a newly formed subsidiary of Union Carbide, became the operator of the 2,000-ton-per-day mill after receiving the approval of State and Federal agencies.

South of La Sal, San Juan County, the Rio Algom unit of Rio Algom Ltd., Toronto, Canada, operated the last surviving uranium mill in the State 5 days per week at below its normal capacity of 750 tons per day. About 150 people were employed at the facility. Plans to add an acid circuit to the original alkaline circuit for more flexibility in treating different types of ore were placed on hold; vanadium was never recovered at this mill.

The Hecla and Union Carbide Lisbon Valley uranium-vanadium mine near Moab remained on a standby basis.

**Zinc.**—A small amount of zinc was mined at Kennecott's Iron Blossom Mine, Juab County.

**Zirconium.**—Western Zirconium Inc. continued to produce primary zirconium sponge and coproduct hafnium sponge and converted the zirconium sponge to ingot. The product was produced from zircon ores imported from Australia at a plant in the Southern Pacific Industrial Park, south of Ogden, Weber County.

The company requested permission from the Utah Water Pollution Control Committee to build a $1 million waste water treatment plant to pump the treated water into Great Salt Lake. The rising lake had invaded some 80 acres in existing ponds where waste water had been stored.

## NONMETALS

**Asphalt (Native) and Other Bitumens.**—Gilsonite production rose about 53% in quantity but declined nearly 27% in value. American Gilsonite Co., a subsidiary of Chevron Corp. (formerly Standard Oil Co. of California) and Hydrocarbon Mining Inc., a subsidiary of Western Strategic Minerals Inc., mined the hydrocarbon from veins near Bonanza, Uintah County. The product was marketed for automobile body sealer and radiator paint, inks, oil well-drilling fluids, cement for sand mold in the foundry industry, and other uses.

**Cement.**—Portland cement producers, listed in descending order of 1984 output, included the Southwestern Portland Cement Co., a wholly owned subsidiary of Southdown Inc., Houston, TX, 550,000-short-ton-per-year, dry-process plant at Leamington, Millard County; the Ideal Basic Industries Inc. 350,000-ton-per-year-capacity, wet-process plant at Devils Slide, Morgan County; and the Lone Star Industries Inc. 420,000-ton-per-year, wet-process plant in Salt Lake City.

Finished portland cement output increased 25%; sales increased nearly 20% in quantity and 26% in value as residential building activity increased significantly and nonresidential construction reached a record high. The average price per ton of portland cement rose from $51.22 in 1983 to $53.93 in 1984. A small amount of cement was transported by rail, but, by far, most was trucked in bulk to the consumers.

On April 3, Southwestern Portland Cement entered into an agreement to lease, with an option to purchase, the Martin Marietta Corp. Leamington portland cement plant in Millard County. The 5-year lease provided two additional 3-year renewal periods at the option of Martin Marietta; however, if Southwestern did not exercise the purchase option, a $10 million termination payment would be required. Southwestern also purchased Martin Marietta's Leamington working capital, estimated at $12 million. According to Southdown's 1984 10K Annual Report, the market area of the plant included central and southern Utah, Colorado's western slope, southeastern Nevada, southwestern Wyoming, and northwestern New Mexico.

The Federal Environment Protection Agency included two dumps at one cement

company on the Superfund list, making the sites eligible for cleanup money if the problem is not voluntarily solved. High concentrations of heavy metals, including arsenic, chromium, and lead, were cited as being present in kiln dust and bricks.

**Clays.**—Clay and shale output increased in quantity and value; the average unit value increased marginally from $7.13 in 1983 to $7.14 in 1984. The principal common clay and shale producer was Utelite Corp., Summit County, followed by Interpace Corp., Utah County; Interstate Brick Co. at its Five-Mile pit, Tooele County, and Jim Gay pit, Utah County; Martin Marietta at its Hank Allen pit, Juab County; and Redmond Clay and Salt Co. at its Sanpete County pit.

Western Clay Co. mined swelling bentonite at its Redmond pit and fuller's earth at its Aurora pit, both in Sevier County. R. D. Wadley Clay Co. mined fire clay at its Wadley pit, Utah County.

The common clays were used mainly for manufacturing face brick and lightweight aggregate, followed by portland cement, terra cotta, floor and wall ceramics, adhesives, and animal feed. The expanded aggregate was used largely in structural concrete and block. Swelling bentonite was used for animal feed, drilling mud, and waterproof sealant. Fire clay was used for foundry purposes and fuller's earth for mineral oil clarification.

**Graphite (Synthetic).**—Hercules Inc., Aerospace Div., at its Bacchus Works, was the principal producer of synthetic graphite, manufacturing the commodity for use in place of metals in aerospace equipment, tennis rackets, leg braces, and for other purposes where weight was important. In 1984, the company, with more than 5,325 employees, became the second largest private industrial employer in the State. Synthetic graphite output increased about 43% in quantity and value.

**Gypsum.**—Although production of gypsum declined, output of the calcined product used for wallboard increased more than 11% in quantity and nearly 21% in value. Georgia-Pacific Corp. and United States Gypsum Co. continued as the principal producers of crude and calcined gypsum. Gypsum was mined 9 and 7 miles, respectively, northeast of the companies' crushing and processing facilities at Sigurd, Sevier County. Crude gypsum was also mined by Thomas J. Peck & Sons Inc. near Nephi, Juab County.

**Lime.**—Lime production decreased in quantity and value as the steel and copper industries cut back production. Leading quicklime producers included Continental Lime Inc., a subsidiary of Steel Bros. Canada Ltd., 35 miles south of Delta and 6 miles west of the plant at the base of the Cricket Mountains, Millard County; Utah Marblehead Lime Co., a subsidiary of General Dynamics Corp., 35 miles northwest of Grantsville, Tooele County; Genstar Lime Co., a subsidiary of Genstar Corp., Toronto, Canada, at Grantsville, Tooele County; and Kennecott Utah Copper Div. Genstar was the sole producer of hydrated lime.

**Magnesium Compounds.**—Although magnesium compounds' sales increased nearly 17% in quantity, their value declined about 4%. Great Salt Lake Minerals, a division of Gulf Resources & Chemicals Corp., with an annual capacity of 100,000 short tons of magnesium oxide equivalent, obtained magnesium chloride and other products from the brines of Great Salt Lake, west of Ogden, Weber County. Magnesium chloride in bitterns was recovered as the final product from the solar evaporation of lake brines. Kaiser Aluminum & Chemical, with an annual capacity of 50,000 tons of MgO equivalent, recovered magnesium compounds using solar evaporation from the brines of Great Salt Lake at its Bonneville plant near Wendover, Tooele County. In a reciprocal purchase of products, Kaiser sold 300,000 tons of magnesium chloride brine to AMAX Magnesium Corp. at Rowley, and Kaiser, in turn, bought 9,000 tons of magnesium metal from AMAX. Unusually wet weather had diluted brines used by AMAX in magnesium metal production.

**Perlite (Expanded).**—Perlite was shipped in from out of State for expansion at the Pax Co. plant in Salt Lake County and at the Georgia-Pacific plant at Sigurd. Production of the treated product declined 9% in quantity and over 13% in value.

**Phosphate Rock.**—Chevron Resources Co. continued as the only phosphate rock producer in the State and mined phosphate rock from the Upper Permian Age Park City Formation 12 miles north of Vernal, Uintah County. Ores were crushed at the minesite and transported by a 10-inch slurry pipeline to the mill for further grinding and classification, followed by flotation. About 18 trucks per day were used to deliver concentrates to the Phoston rail terminal, north of Heber, Wasatch County, for shipment to Canadian fertilizer plants.

As part of a $250 million phosphate fertilizer complex to be built in Wyoming and Utah, Chevron began a $70 million expansion project at its mine and beneficiation plant near Vernal. New autogenous and conventional grinding mills and two pumping stations were installed at Vernal. Extensive reclamation work, including recontouring the area, repositioning topsoil, and seeding was continued on some currently and previously mined land in the Brush Creek area. A 10-inch-diameter phosphate slurry pipeline was to be laid 95 miles from the beneficiation plant to a new 400,000-ton-per-year ammonium phosphate fertilizer plant near Rock Springs, WY. Construction on the Wyoming plant began in mid-1984 and was scheduled for completion in late 1986. Up to 1.8 million tons per year of phosphate concentrates will be slurried and pumped over a 7,200-foot pass in the Uintah Mountains. Water for the slurry will come from reclaimed waste water at the Vernal operation. The Phoston railhead operation will be discontinued as will shipments of six cars per day of phosphate concentrate to Salt Lake City.

Utah phosphate rock production declined about 5% in quantity and value in 1984, while output of the combined Western States, Idaho, Montana, and Utah, producing more than 10% of the Nation's phosphate, dropped less. According to Chevron, production of about 550,000 short tons of concentrates per year in 1984 was expected to increase to 1.3 million tons by 1986. The quantity of ore mined per year will be increased from 1.5 to 3.5 million tons.[9]

About 130 persons were employed at the Brush Creek area operation in 1984. An average of 400 workers were to be employed during the construction period.

**Potash.**—Nationally, Utah ranked second in potash production, behind New Mexico and followed by California. In contrast to increased output and sales in the other two States, Utah's production of potassium salts decreased 32%. Total sales declined nearly 13% in quantity and 30% in value of $K_2O$ equivalent. Stocks dropped 66% by the end of the reporting period. The decrease in output and the drop in stocks of potassium salts was due to heavy precipitation and consequent dilution of brines and the flooding of evaporation ponds in the Great Salt Lake area.

Two companies, Texasgulf Chemicals Co. of Texasgulf Inc. and Kaiser Chemicals of Kaiser Aluminum & Chemical, recovered potassium salts in the State. Texasgulf, a subsidiary of Société Nationale Elf Aquitaine (a 67% French Government-controlled oil company), recovered potassium salts at its Cane Creek operation near Moab, Grand County. Pennsylvanian Age evaporites were solution mined using geothermal heat to dissolve the potash at a depth of 2,789 feet. Brines were pumped to the surface for evaporation on 400 acres of solar ponds and salts harvested and processed by flotation to recover potassium salts and byproduct salt.

According to the Elf Aquitaine Inc. 1984 annual report, potash production was 142,000 tons in 1984, compared with 157,000 tons in 1983. In the Cane Creek area, the decrease in output was attributed to deferring the harvest of some 1984 potash from the solar ponds until 1985.

The Kaiser solar evaporation operation near Wendover covered about 87,816 acres from which, in normal times, natural brines were collected in 140 miles of ditches on the Bonneville Salt Flats of Great Salt Lake. The brines were concentrated in a primary 8,000-acre evaporation pond. Potassium salts were processed through a flotation concentrator to separate the halite (sodium chloride) and sylvite (potassium chloride). The facilities, which were closed in the fall of 1983 owing to excessive rain and flooding in the area, remained idle during most of 1984. Customers were supplied from inventories throughout the year. During the summer of 1984, gathering canals dried out, allowing the company to harvest some crude salts for potash production by year-end.

Great Salt Lake Minerals normally recovered potassium sulfate (also called sulfate of potash), salt, sodium sulfate, and magnesium chloride from the concentrated brines of Great Salt Lake. The brines were pumped from the north arm of the lake to 19,500 acres of solar evaporation ponds on Bear Lake Bay west of Ogden at Little Mountain, Weber County. The processes included selective crystallization and deposition of salts. The products either were sold in a crude state or were processed into finished commodities at the plant.

On May 5, nearly 85% of its solar evaporation ponds were flooded when the outer dike of the system was breached, resulting in severe damage to dikes, pond floors, bridges, pump stations, and other structures. Brine solutions were diluted, rendering them unsuitable for the production of sulfate of potash. Great Salt Lake Minerals

received a $10 million advance from a business interruption insurance claim and continued to repair dikes to protect the pond system. In 1983, the company spent $8.1 million and, in early 1984, $8.3 million to raise the dikes. Several years will be required to resume full production of potassium sulfate. Before the flooding of its ponds, the firm was the largest producer of potassium sulfate, a specialty fertilizer, in the United States.

According to the Gulf Resources & Chemical Corp. 1984 10K Annual Report, potassium sulfate production declined from a high of 203,000 short tons in 1981, to 150,000 in 1983, to zero in 1984, because of the wet weather cycle, which began in 1982 and continued during 1984, raising Great Salt Lake to near record-high levels. In August, because of the flooding, 50 employees were laid off, reducing the work force to 190.

On November 1, Buttes Resources Co., a subsidiary of Buttes Gas & Oil Co., and the Bureau of Land Management (BLM) signed a potash mining lease on approximately 12 square miles of Federal land near the Grand County airport, 12 miles north of Moab. Application to BLM for prospecting permits started in 1972, initial exploration in the area began in 1978, and several million dollars had been spent on the project by 1984. Full-scale development of a solution mine was expected within a few years, with production of 1 million tons of potash annually and employment for 350 workers.

**Salt.**—Solar salt was produced in Grand County by Texasgulf; in Salt Lake County by Morton Salt Co., a division of Morton-Thiokol Inc.; in Tooele County by American Salt Co., a subsidiary of General Host Corp.; and in Weber County by Great Salt Lake Minerals. In Grand County, Moab Brine Co., a subsidiary of La Sal Oil Co., recovered salt from brine; and in Sevier County, Redmond Clay and Salt Co. obtained rock salt at the American Orsa open pit salt mine at Redmond. Salt sales rose more than 33% in quantity and nearly 24% in value because of the severe winter, resulting in an increased demand for salt to deice the roads.

Redmond Clay and Salt had one of the largest open pit salt mines in the West and produced rock salt, used principally for livestock purposes. A major portion of the product was shipped to the States adjacent to Utah.

General Host placed its American Salt on the market in the spring and, after Diamond Crystal Salt Co. turned down a Letter of Intent to purchase, the company was still for sale at yearend. American Salt's Grantsville facility consisted of approximately 15,000 acres and 4,800 acres in leases; concentrating and crystallizing ponds for solar evaporation; a washing station and bulk storage area; and a refining mill for sizing, mixing, and packaging products. During 1983 and 1984, the company raised its perimeter dike to protect its pond system from the rising waters of Great Salt Lake, thereby maintaining the company's salt production level. Other companies in the area were severely impacted by flooding.

**Sand and Gravel.**—*Construction.*—Construction sand and gravel production is surveyed by the U.S. Bureau of Mines for even-numbered years only; the 1983 chapter gave estimates. Data for odd-numbered years are based on annual company estimates made before yearend.

Construction sand and gravel production in Utah increased during the year. In 1984, 63 producers obtained construction sand from 99 operations in 24 counties. The major producing counties were Salt Lake, with about 33% of the State total; Davis, with about 11%; and Utah, with about 9%. Ten leading construction sand and gravel producers, each of whom produced more than 500,000 short tons, provided 57% of the production in the State. The following, listed in descending order of output, were the largest sand and gravel producing companies: Monroc Inc., Jack B. Parson Construction Co., Gibbons and Reed Co., Peter Kiewit and Sons Co., MAC/CEI Joint Venture Co., and Geneva Rock Products Co., collectively accounting for more than 40% of the total. The major use of sand and gravel in the State was in road base and coverings and stabilization, followed by concrete aggregate, asphaltic concrete, and fill. All transport of sand and gravel was by truck. The average value of sand and gravel sold during the year was $2.27.

*Industrial.*—Industrial sand is surveyed every year and in 1984 was produced by one company at one site in Salt Lake County. Total output was very small and was used entirely for molding and core and sandblasting.

Table 5.—Utah: Construction sand and gravel sold or used by producers in 1984, by use

| Use | Quantity (thousand short tons | Value (thousands) | Value per ton |
|---|---|---|---|
| Concrete aggregate | 2,881 | $7,359 | $2.55 |
| Plaster and gunite sands | 70 | 177 | 2.54 |
| Concrete products | 27 | 80 | 2.96 |
| Asphaltic concrete | 1,546 | 4,976 | 3.22 |
| Road base and coverings[1] | 2,888 | 6,809 | 2.36 |
| Fill | 1,431 | 1,759 | 1.23 |
| Snow and ice control | 37 | 58 | 1.57 |
| Other[2] | 6,337 | 13,289 | 2.10 |
| Total or average | 15,217 | 34,507 | 2.27 |

[1]Includes road and other stabilization (cement).
[2]Includes other unspecified uses.

**Sodium Sulfate.**—Great Salt Lake Minerals continued to recover byproduct sodium sulfate from the brines of Great Salt Lake at its operation west of Ogden despite the effects of the flooded ponds. Of the three States producing the product—California, Texas, and Utah—Utah ranked third. Output of the commodity remained the same as that of 1983, however, it rose slightly in value.

**Stone.**—Stone production is surveyed by the U.S. Bureau of Mines for odd-numbered years only; therefore, this chapter contains only estimates for 1984. Data for even-numbered years are based on annual company estimates made before yearend.

The quantity and value of crushed stone production increased again as railroads and industries on the shores of Great Salt Lake continued to raise and strengthen rail lines across the lake and to construct dikes protecting magnesium, potash, and salt plants. In one example, at a cost of $48 million over the past 2 years, the Southern Pacific Transportation Co. raised about 40 miles of rail line as much as 7 feet to safeguard its causeway across the north arm of Great Salt Lake.

**Sulfur (Recovered).**—Sulfur recovered from the Chevron Oil Co. refinery in Davis County increased in quantity but declined in value.

**Sulfuric Acid.**—Utah ranked third among the States in output of byproduct sulfuric acid. Recovered as a byproduct of copper production, the quantity of the commodity produced in the State declined but rose in value. Nationally, sulfuric acid production increased substantially.

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[1]State Mineral Officer, Bureau of Mines, Denver, CO.
[2]Gillam, D. 1984 Construction Value Reaches $1.5 Billion. Utah Construction Rep., 1984, v. 27, No. 4, 1984, pp. 1-4.
[3]Wallace, G. J. The Great Salt Lake Incremental Sampling Program. Survey Notes (Utah Geological and Mineral Survey), v. 18, No. 1, Spring 1984, pp. 1, 4-5, 10.
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[4]Russell, W. Only U.S. Gallium-Germanium Brine On Line Soon. Intermountain Pay Dirt, No. 63, Dec. 1984, p. 1, 4A, 5A.
[5]Turk, T. W., and S. A. Sass. Engineering Design of the Mercur Gold Project Ore Processing Facility. Min. Eng., v. 36, No. 11, Nov. 1984, pp. 1563-1567.
[6]Woodworth, W. De-Steeling: Structural Disinvestment of U.S. Steel and Its Implications for Regional Economics. 2d ed., Alexander Printing Co., Provo, UT, 1985, 224 pp.
[7]Burger, J. R. Ranchers End-Slices Escalante Silver Deposit. Eng. Min. J., v. 184, No. 1, Jan. 1984, pp. 48-53.
[8]James, L. P. The Tintic Mining District. Survey Notes, v. 18, No. 2, Summer 1984, pp. 1, 4-13.
[9]Vernal Express. Phosphate Activity to Escalate. Oct. 17, 1984.

**Table 6.—Principal producers**

| Commodity and company | Address | Type of activity | County |
|---|---|---|---|
| Asphalt: | | | |
| American Gilsonite Co., a subsidiary of Chevron Corp. | Suite 1150, Kennecott Bldg. Salt Lake City, UT 84133 | Underground mines and plant | Uintah. |
| Hydrocarbon Mining Inc., a subsidiary of Western Strategic Minerals Inc. | North 9507 Division St. Suite A Spokane, WA 99218 | ____do | Do. |
| Beryllium: | | | |
| Brush Wellman Inc. | 67 West 2950 South Salt Lake City, UT 84115 | Open pit mines and plant | Juab and Millard. |
| Cement: | | | |
| Ideal Basic Industries Inc., Cement Div.[1] | Star Route Morgan, UT 84050 | Quarries and plant | Morgan. |
| Portland Cement Co. of Utah, a division of Lone Star Industries Inc.[1] | 615 West 800 South Box 1469 Salt Lake City, UT 84110 | ____do | Salt Lake. |
| Southwestern Portland Cement Co., a subsidiary of Southdown Inc.[1 2] | 4885 South 900 East Salt Lake City, UT 84117 | ____do | Millard. |
| Clays: | | | |
| Interpace Corp., Structural Div. | 736 West Harrisville Rd. Box 447 Ogden, UT 84402 | Open pit mines and plant | Utah. |
| Interstate Brick Co., a subsidiary of Mountain Fuel Co. | 9780 South 5200 West West Jordan, UT 84084 | ____do | Tooele and Utah. |
| Utelite Corp | Box 387 Coalville, UT 84017 | Open pit mine and plant | Summit. |
| Western Clay Co.[1] | Box 1067 Aurora, UT 84620 | Open pit mines | Sevier. |
| Copper: | | | |
| Kennecott, a subsidiary of Kennecott Corp., Utah Copper Div.[3] | 1129 East 3900 South Box 6500 Salt Lake City, UT 84106 | Open pit mine, mills, smelter, refinery. | Salt Lake. |
| Gold: | | | |
| Getty Mining Co., a subsidiary of Texaco Inc. | Box 838 Tooele, UT 84074 | Open pit mine, mill, carbon-in-pulp plant. | Tooele. |
| Gypsum: | | | |
| Georgia-Pacific Corp | Box 80 Sigurd, UT 84657 | Open pit mine and plant | Sevier. |
| United States Gypsum Co | Box 120 Sigurd, UT 84657 | ____do | Do. |
| Iron and steel: | | | |
| United States Steel Corp.[1] | Geneva Works Box 510 Provo, UT 84603 | Steel plant | Iron. |
| Lime: | | | |
| Continental Lime Inc., a subsidiary of Steel Bros. Canada Ltd.[1] | 268 West 400 South Suite 201 Salt Lake City, UT 84101 | Quarry and plant | Millard. |
| Genstar Lime Co., a subsidiary of Genstar Corp.[1] | Box 357 Grantsville, UT 84029 | Open pit mine and plant | Tooele. |
| Utah Marblehead Lime Co., a subsidiary of General Dynamics Corp.[1] | Box 596 Grantsville, UT 84029 | ____do | Do. |
| Magnesium: | | | |
| AMAX Magnesium Corp., a subsidiary of AMAX Inc. | 238 North 2200 West Salt Lake City, UT 84116 | Solar evaporation plant | Do. |
| Phosphate rock: | | | |
| Chevron Resources Co., a subsidiary of Chevron Corp. | Manila Star Route Vernal, UT 84078 | Open pit mine and plant | Uintah. |
| Potassium salts: | | | |
| Great Salt Lake Minerals & Chemicals Corp., a division of Gulf Resources & Chemicals Corp.[4] | 765 North 10500 West Little Mountain Box 1190 Ogden, UT 84402 | Solar evaporation, concentrator, plant. | Weber. |
| Kaiser Aluminum & Chemical Corp., Bonneville Ltd. Div.[5] | Box 580 Wendover, UT 84083 | ____do | Tooele. |
| Texasgulf Inc., a subsidiary of Société Nationale Elf Aquitaine.[6] | Box 1208 Moab, UT 84532 | Solution mine, solar evaporation, concentrator, plant. | Grand. |
| Salt: | | | |
| American Salt Co | Box 477 Grantsville, UT 84029 | Plant | Tooele. |
| Morton Salt Co., a division of Morton-Thiokol Inc. | A.M.F. Box 22054 Salt Lake City, UT 84122 | ____do | Salt Lake. |

See footnotes at end of table.

**Table 6.—Principal producers —Continued**

| Commodity and company | Address | Type of activity | County |
|---|---|---|---|
| Sand and gravel: | | | |
| Construction: | | | |
| Concrete Products Co., a division of Gibbons & Reed Co. | 41 West Central Ave.<br>Box 7356<br>Murray, UT 84107 | Pits and plant | Davis, Salt Lake, Summit, Tooele, Utah, Weber. |
| Peter Kiewit and Sons Co. | 370 West 5900 South<br>Box 7780<br>Murray, UT 84107 | do | Sevier. |
| Monroc Inc | 1730 North Beck St.<br>Box 537<br>Salt Lake City, UT 84110 | do | Salt Lake. |
| Jack B. Parson Construction Co. | Box 3429<br>Ogden, UT 84409 | Pits and plants | Box Elder, Cache, Davis, Morgan. |
| Industrial: | | | |
| Salt Lake Valley Sand & Gravel Co. | 800 North 1550 West<br>Orem, UT 84057 | Pit | Salt Lake. |
| Silver: | | | |
| Hecla Mining Co., Escalante Unit. | Box 308<br>Enterprise, UT 84725 | Underground mine, mill, plant. | Iron. |
| Vanadium: | | | |
| Atlas Minerals Div., Atlas Corp. | Box 1207<br>Moab, UT 84532 | Underground mines and mill | Emery, Grand, San Juan. |
| Energy Fuels Nuclear Inc | Box 787<br>Blanding, UT 84511 | Underground mines, ore-buying station, research laboratory. | Emery, Garfield, San Juan. |
| Umetco Minerals Corp., a subsidiary of Union Carbide Corp. | Box 1029<br>Grand Junction, CO 81501 | Underground mines and mill | Grand and San Juan. |

[1] Also stone.
[2] Also clays.
[3] Also gold, lime, molybdenum, rhenium, selenium, silver, and stone.
[4] Also magnesium compounds, salt, and sodium sulfate.
[5] Also magnesium compounds.
[6] Also salt.

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